

System of Environmental Economic Accounting

# Review of Ecosystem Condition Accounting Case Studies (Discussion Paper 2.2)

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### Selection of case studies



#### Type A case studies: "Strict" condition accounts

	Country	Short title		Realm	Scope	Date		
A1	Australia	Port Phillip Bay		Terrestrial, marine		Sub-national		2016
A2	Austr 4 cou	untries Barrier Reef	Mainly to	errestrial & inland water:	ne	Sub-national		within last
A3	Australia	State of Victoria	, ma	rine less developed		Sub-national	AII	6 years
A4	Australia	Victoria Central Highla	ands	Terrestrial	1	Sub-national		2017
A5	Australia	Accounting for Nature	e Trials	Terrestrial, inland water, mari	ne	Sub-national		2016
A6	Australia	Victoria's Parks		Terrestrial, inland water, mari	ne Ma	jority sub-nat	ional	2015
A7	Canada	MEGS		Terrestrial (for condition)		National		2013
A8	Neth.	Limburg Province		Terrestrial, inland water	Sub-national		2014	
A9	S. Africa	National river account	ts	Inland water		National		2015
A10	UK	Woodlands		Terrestrial		National		2015
A11	UK	Freshwater ecosysten	าร	Inland water		National		2015
A12	UK	PAs in England & Scot	land	Terrestrial, inland water, mari	ne	Sub-national		2015
A13	UK	Forest Enterprise Eng	land	Terrestrial		Sub-national(	?)	2017
A14	UK	Green space in urban	areas	Terrestrial		National		2018

### Main issues considered in the review

- 1. Indicators used
- 2. Aggregation of indicators
- 3. Reference levels and reference condition
- 4. Reporting the account



#### Some observations

## 1. Indicators

- Rationale for indicators generally not explained
- No explicit typology of ecosystem condition indicators
- No one-size-fits-all but some common indicators across realms and ecosystem types
- The most comprehensive accounts use a hierarchy of indicators, subindices and overall index

# 2. Aggregation

- Used in 8 cases
- Sometimes to a single index or score (e.g. 0-1, 0-11), sometimes to a category (e.g. good, fair, poor), sometimes both

#### Comprehensive accounts use a two-step thematic aggregation: Indicators → Sub-indices → Index and/or Category

## 3. Reference levels and reference condition

- Only 7 tables include reference or baseline values
- Sometimes implicit

## 4. Reporting the account

#### From the Technical Recommendations:

Table 4.1: Initial example of an ecosystem condition account

						Pro	xy ec	osyste	m typ	e (bas	ed on l	and co	over)				
		Artificial surfaces	Herbaceous crops	Woody crops	Multiple or layered crops	Grassland	Tree-covered areas	Mangroves	Shrub-covered areas	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow and glaciers	Inland water bodies	Coastal water and inter-tidal areas	Sea and marine areas	
Example indicators of condition		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Vegetation (e.g. native cover)	Opening condition																
	Closing condition																
Water quality (e.g. turbidity, pH)	Opening condition																
	Closing condition																
Soil (e.g. erosion, pH, nutrients)	Opening condition																
	Closing condition																
Carbon (e.g. net primary productivity)	Opening condition																
	Closing condition																
Biodiversity (e.g. species richness)	Opening condition																
	Closing condition																
Habitats (e.g. fragmentation)	Opening condition																
	Closing condition																
Overall index of condition	Opening condition																
	Closing condition																

### A3. State of Victoria

#### Terrestrial

Table 1. Victorian terrestrial extent and condition classified by Major Vegetation Groups: 1750, 2005

	17	750	200	5 (a)	20	05 (b)
		Mean		Mean		Mean
Major Vegetation Group (NVIS)	Extent (Ha)	condition/Ha	Extent (Ha)	condition/Ha	Extent (Ha)	condition/Ha
Native vegetation						
Acacia Forests and Woodlands	22,885	1.00	41,237	0.60	18,845	0.64
Acacia Open Woodlands	271	1.00	NA	NA	256	0.61
Acacia Shrublands	15,874	1.00	109	0.35	10,053	0.59
Callitris Forests and Woodlands	5,549	1.00	464	0.33	1,934	0.40
Casuarina Forests and Woodlands	1,003,122	1.00	186,411	0.48	190,513	0.51
Chenopod Shrublands, Samphire Shrublands and Forblands	214,488	1.00	55,516	0.51	113,563	0.56
Eucalypt Open Forests	6,346,166	1.00	3,899,116	0.65	4,976,481	0.63
Eucalypt Open Woodlands	1,223,235	1.00	1	0.60	250,677	0.46
Eucalypt Tall Open Forests	53,605	1.00	632,333	0.68	53,576	0.71
Eucalypt Woodlands	7,532,842	1.00	1,559,369	0.57	2,459,569	0.46
Heathlands	299,343	1.00	35,914	0.63	244,461	0.59
Low Closed Forests and Tall Closed Shrublands	206,330	1.00	NA	NA	35,241	0.44
Mallee Open Woodlands and Sparse Mallee Shrublands	213,785	1.00	NA	NA	43,380	0.53
Mallee Woodlands and Shrublands	3,395,152	1.00	1,509,023	0.56	1,577,654	0.56
Mangroves	7,025	1.00	1,010	0.53	5,006	0.55
Melaleuca Forests and Woodlands	89	1.00	14,910	0.50	65	0.57
Naturally bare - sand, rock, claypan, mudflat	4,619	1.00	3,066	0.35	4,459	0.44
Other Forests and Woodlands	63,290	1.00	287,940	0.59	55,756	0.69
Other Grasslands, Herblands, Sedgelands and Rushlands	202,082	1.00	142,010	0.59	97,547	0.54
Other Open Woodlands	122	1.00	NA	NA	77	0.41
Other Shrublands	295,419	1.00	103,193	0.61	159,251	0.58
Rainforests and Vine Thickets	44,109	1.00	36,630	0.71	40,164	0.70
Tussock Grasslands	1,302,356	1.00	28,486	0.33	139,989	0.40
Unclassified native vegetation	45,808	1.00	1	0.73	8,074	0.61
Total native vegetation	22,497,566	1.00	8,536,739	0.61	10,486,591	0.57
I and not descrifted as notive vegetation						
Land not classified as native vegetation	1 677				1 612	
Island aquation frachwater calt letter tracers	1,0//	NA	177 400	NA	1,013	NA
Cleared non notive vegetation buildings	197,128	NA	265 190	NA	243,037	NA
Unknown fan data	-	NA	505,180	NA	11,955,418	NA
Unknown/no data	2 076	NA	5/5,185	NA	10,166	NA
Tatal non-articles	2,976	NA	13,044,837	NA	12 212 750	NA
I otal non-hative vegetation	201,781	NA	14,162,608	NA	12,212,756	NA

### A3. State of Victoria

Table 7. Victorian wetland extent and condition classified by wetland system and origin: 1750, 1994, 2012

1750

100/

2012

#### Wetlands

	1/3		15	54	20	12
		Average		Average		Average
Wetland system type and origin (2012)	Extent (Ha)	condition	Extent (Ha)	condition	Extent (Ha)	condition
Origin - Naturally occuring wetlands						
Estuarine	41,001	1	31,455	unknown	35,467	0.71
Lacustrine	152,437	1	138,998	unknown	169,083	0.65
Marine	3,216	1	3,160	unknown	3,302	unknown
Palustrine	218,763	1	187,497	unknown	289,405	0.78
Palustrine or Lacustrine (unknown specifics)	3,745	1	1,005	unknown	6,919	0.40
Unclassified	250,418	1	-	unknown	-	NA
Total natural wetlands	669,580	1	362,115	unknown	504,176	0.70
Origin - Non-naturally occuring wetlands						
Estuarine	-	NA	25,331	unknown	26,860	0.71
Lacustrine	-	NA	84,606	unknown	98,399	0.57
Marine	-	NA	41	unknown	633	unknown
Palustrine	-	NA	11,535	unknown	26,169	0.72
Palustrine or Lacustrine (unknown specifics)	-	NA	47	unknown	2,015	unknown
Unclassified	-	NA	46,499	unknown	-	NA
Total non-natural wetlands	-	NA	168,059	unknown	154,076	0.64
Total wetlands	669,580	1	530,174	unknown	658,252	0.69
Land not classified as wetland	22,029,767	NA	22,169,173	NA	22,041,095	NA

# A8. Limburg Province

Agricultural land1Non-peren. plants53,6293,5307611 <th< th=""><th></th><th></th><th></th><th>EU ext</th><th>ent 20</th><th>13</th><th>F sta</th><th>hys te i</th><th>nd.</th><th>Er</th><th>ıv. S</th><th>itate</th><th>indi</th><th>c.</th><th>Ec</th><th>osys</th><th>. sta</th><th>te in</th><th>d.</th><th></th></th<>				EU ext	ent 20	13	F sta	hys te i	nd.	Er	ıv. S	itate	indi	c.	Ec	osys	. sta	te in	d.	
Agricultural land       1       Non-perenn. plants       53,629       3,530       7       Image: Constraint of the constraint		EU map unit number	Ecosystem Units	extent in ha	of which protected*	protected in %	annual rainfall	annual no. growing days	depth to groundwater table	nitrogen content	heavy metal content	PM2.5 concentration (ug per m3)	PM10 concentration (ug per m3)	nitrous oxide exceedance days	degree of fragmentation	naturalness of biota	species richness	red-listed species	water quality	
2Perennial plants8,1331,01212III15.12.1III	Agricultural land	1	Non-perenn. plants	53,629	3,530	7						15.1	23.1							
3 Greenhouses       995       -		2	Perennial plants	8,133	1,012	12						15.1	23.1							
4       Meadows       27,066       5,224       19       I       I       15.1       23.0       I <th></th> <th>3</th> <th>Greenhouses</th> <th>995</th> <th>-</th> <th>-</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>15.2</th> <th>23.1</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>1</th>		3	Greenhouses	995	-	-						15.2	23.1							1
5       Hedgerows       2,940       2,481       84       Image: Constraint of the constraint of th		4	Meadows	27,066	5,224	19						15.1	23.0							
6       Farmyards, barns       2,142       45       2       I		5	Hedgerows	2,940	2,481	84						14.9	22.4							
totals       94,905       12,293       Image: Constraint of the constraint of th		6	Farmyards, barns	2,142	45	2						15.2	23.5							
Dunes and       11       Dunes perm. veg.       -<			totals	94,905	12,293															
beaches       12       Active coastal dunes       -	Dunes and	11	Dunes perm. veg.	-	-															
13 Beaches	beaches	12	Active coastal dunes	-	-															
		13	Beaches	-	-															

		cocara	-	-								
Forests and other	21	Deciduous forest	11,414	8,297	73			15.1	22.7			
(semi) natural	22	Coniferous forest	7,091	6,694	94			14.8	22.6			
environments	23	Mixed forest	10,437	9,498	91			14.8	22.5			
incl. unpaved	24	Heath land	2,149	2,091	97			14.7	22.2			
terrain	25	Inland dunes	114	99	87			14.6	22.1			
	26	Fresh water wetlands	936	919	98			15.0	23.1			
	27	Natural grassland	3,121	2,847	91			15.0	22.5			
	28	Public green space	4,761	-	-			15.1	22.6			
	29	Other unp. terrain	22,591	3,623	16			15.1	22.9			
		totals	62,614	34,067								
Temp. inundated	31	River flood basin	14,126	5,494	39			15.0	22.4			
lands	32	Salt marshes	-	-				15.1	22.7			
		totals	14,126	5,494								
Built up areas		(units 41-48)	42,349	-				15.2	22.7			
Water	51	Sea										
	52	Lakes and ponds	3,122	1,105	35			15.1	22.5			
	53	Rivers and streams	3,807	2,407	63			15.0	22.7			
		totals	6,929	3,512								
		Totals Limburg	220,922	55,366								

### 9. South Africa: National River Accounts

#### At the most detailed level: 4 **indicators** of ecosystem condition

- Flow
- Water quality
- Riparian habitat
- Instream habitat

#### Table D: Ecosystem condition account for main rivers using four ecological condition indicators, 1999 – 2011

		Degree of mod	lification fro	om natural		
Kilometres	None/ small	Moderate	Large	Serious/ Critical	No Data	Total
FLOW						
Opening stock 1999	34 084	22 814	10 328	5 447	3 637	76 310
Opening stock as a % total river length	45	30	14	7	5	100
Increase/decreases	-10 546	-2 316	6 017	5 129	1 715	
Increases/decreases as % opening stock	-31	-10	58	94	47	
Opening stock 2011	23 538	20 499	16 345	10 576	5 352	76 310
Opening stock as a % total river length	31	27	21	14	7	100
WATER QUALITY						
Opening stock 1999	40 579	24 634	5 518	1 943	3 637	76 310
Opening stock as a % total river length	53	32	7	3	5	100
Increase/decreases	-5 769	-3 591	6 149	1 496	1 715	
Increases/decreases as % opening stock	-14	-15	111	77	47	
Opening stock 2011	34 810	21 043	11 667	3 439	5 352	76 310
Opening stock as a % total river length	46	28	15	5	7	100
STREAM BANK/RIPARIAN HABITAT						
Opening stock 1999	22 469	32 951	14 164	3 088	3 639	76 310
Opening stock as a % total river length	29	43	19	4	5	100
Increase/decreases	-50	-3 612	1 255	1 667	740	
Increases/decreases as % opening stock		-11	9	54	20	
Opening stock 2011	22 418	29 339	15 420	4 755	4 379	76 310
Opening stock as a % total river length	29	38	20	6	6	100
INSTREAM HABITAT						
Opening stock 1999	39 736	26 188	5 446	1 301	3 639	76 310
Opening stock as a % total river length	52	34	7	2	5	100
Increase/decreases	-11 245	426	8 180	1 898	740	
Increases/decreases as % opening stock	-28	2	150	146	6 840	
Opening stock 2011	28 491	26 615	13 626	3 200	4 379	76 310
Opening stock as a % total river length	37	35	18	4	6	100

Table E: Ecosystem condition account for rivers based on the aggregated ecological condition category, for main rivers, tributaries and all rivers

		Degree of mo	odification fro	om natural		
Kilometres	Natural	Moderately modified	Heavily modified	Unaccept- ably modified	No Data	Total
MAIN RIVERS						
Opening stock 1999	46 541	22 315	2 791	1 026	3 637	76 310
Opening stock as a % total river length	61	29	4	1	5	100
Increase/decreases	-24 100	9 467	13 168	1 465		
Increases/decreases as % opening stock	-52	42	472	143		
Opening stock 2011	22 441	31 782	15 960	2 492	3 637	76 310
Opening stock as a % total river length	29	42	21	3	5	100
TRIBUTARIES						
Opening stock 1999	40 294	7 470	2 084	328	37 047	87 223
Opening stock as a % total river length	46	9	2		42	100
Increase/decreases	-17 062	11 339	4 766	957		
Increases/decreases as % opening stock	-42	152	229	292		
Opening stock 2011	23 232	18 809	6 850	1 285	37 047	87 223
Opening stock as a % total river length	27	22	8	1	42	100
ALL RIVERS						
Opening stock 1999	86 835	29 784	4 875	1 354	40 684	163 533
Opening stock as a % total river length	53	18	3	1	25	100
Increase/decreases	-41 163	20 806	17 935	2 422		
Increases/decreases as % opening stock	-47	70	368	179		
Opening stock 2011	45 673	50 591	22 810	3 776	40 684	163 533
Opening stock as a % total river length	28	31	14	2	25	100

#### ← Aggregated ecological condition category

Table 15: The Ecological Condition Index for 1999 and 2011 for main rivers and tributaries, on a scale of 0 – 100

	Main rivers	Tributaries	All rivers
1999	81.3	84.9	82.8
2011	70.1	75.2	72.2
Change between			
1999 and 2011	-11.2	-9.7	-10.6

#### Aggregated ecological condition index $\rightarrow$

#### A10. UK Woodlands

Table 4.1: Physical account of ecosystem condition and extent (stock) at the end of an accounting period for GB woodland

Ecosystem: Woodland 2012	Ecosystem extent	Characteristi	cs of ecosyster	n cono	lition	_				_	_					
	Total Area	Species Type (Extent and	e Volume)			Age (years)				Biomass Stock	Carbon Stock	¢	Woodlar Areas <sup>10</sup>	nd in Flo	od Risk	Woodland SSSI
		Broadleav ed (BL)	Coniferous (C)	BL	c	0-40	41-60	61-80	>80	Total	Total Biomass	Total Soil	FZ1	FZ2	FZ3	
	(million ha) 1	Extent (mill	ion ha) ²	Volun (mill	ne m3) <sup>3</sup>	Age by V (mill m3	(olume })⁴			Million tonnes (Mt) oven dry⁵	MtCO2 <sup>6</sup>	MtCO2 <sup>7</sup>	Extent (	mill ha)	ŝ	Extent (mill ha)°
Coverage (Countries/ regions)	GB	GB		GB		GB				GB	GB	SW England	E&W	E&W	E&W	GB
Closing Stock (2012)	2.78	1.27	1.51	239	375	163	251	105	109	426	780	133	2.61	0.094	0.075	0.243

A11.	UK	Freshwater
Ecosy	yste	ms

	Ecosystem Extent	Characteris	stics of cond	dition		
	Land cover	Ecological	condition	Soil		Accessibility
Indicators		Wetland birds	Mean species richness	Mean total nitrogen stock	Mean carbon conc <sup>6</sup>	Accessible wetlands - population with access to wetlands within X kilometres <sup>1</sup>
Units of measure	Size of area (hectares in '000)	No. of wetland birds at inland wetland sites in the UK ('000)	Diversity of species per pond	Mean total nitrogen in soil(% of dry soil)	Mean level of carbon in soil in (gram/ kilogram <sup>-1</sup> )	-
Year 2008	2833 (2007) <sup>2</sup>	4666	39.1 (2007)	1.5 (2007)	401.2 (2007)	-
Net change <sup>3</sup>	0	163	-5.4	<sup>4</sup> -0.2	-17.2	-
Year 2012	2833 <sup>5</sup>	4829	33.7	1.3	384.0	-

#### Wetlands

#### Table notes:

1. Further analysis is required to develop this indicator.

2. The bracket shows the year of the data.

3. Net change is the difference between the opening and the closing period.

4. Expressed in percentage points.

 These numbers are based on extrapolating from 1998 – 2007. The rate of change between 1998 and 2007 was not statistically significant and therefore the area of land cover is estimated to have remained the same.

6. Mean carbon concentration.

Open water	Ecosystem Characteristics of condition Extent						
	Indicators Units of measure	Land cover Size of area (hectares in '000)	Water		Ecological condition		Accessibility
			Mean reservoir stock	River Flow	River Surface water status Flow		Accessible open waters - population with access to open waters within X kilometres <sup>3</sup>
			Average number of reservoirs above or below mean normal capacity	Percentage of rivers recorded as normal and abnormal	Percentage of rivers and canals in high, moderate or bad ecological condition <sup>1</sup>	Percentage of lakes in high, moderate or bad ecological condition <sup>2</sup>	 ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;
	Year 2008	331 (2007) <sup>4</sup>	19 / 12	<sup>5</sup> 47 / 53	2 / 50 / 4	6 / 44 / 3	-
	Net change	6	2/-2	<sup>6</sup> - 21 / 21	0 / -4 / 0	0 / 2 /-1	-
	Year 2012	337	21 / 10	26 / 74	2 /46 / 4	6 / 46 / 2	-

#### Table notes:

 In 2008, 2% of rivers were in high ecological condition, 30% in good, 50% in moderate, 14% poor and 4% bad. Whereas in 2012, 2% of rivers were in high ecological condition, 31% in good, 46% moderate, 17% poor and 4% in bad ecological condition.

- In 2008, 6% of lakes were in high ecological condition, 37% in good, 44% in moderate, 10% in poor and 3% in bad. Whereas in 2012 6% of lakes were in high ecological condition, 31% in good, 46% in moderate, 14% in poor and 2% in bad - figures may not sum to 100% due to rounding.
- 3. Further research is required to develop this indicator.
- 4. Figures in brackets show the year data were produced.
- 5. In 2008, 10% of all rivers assessed recorded exceptionally high levels of river flow, 21% above normal, 15% notably high, 47% normal, 6% below normal, 1% notably low and 0% recorded expectionally low levels. In 2012, 16% of all rivers assessed recorded exceptionally high levels of river flow, 17% notably high, 20% above normal, 26% normal, 6% below normal, 8% notably low and 7% exceptionally low levels.